CEILING SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to a ceiling system. More particularly, the present invention relates to a readily reconfigurable ceiling system that supports various functional elements e.g., power and data delivery elements in a highly organized manner.

Background Art

In the space above the head of a worker, conventional drop-down ceiling panels have been used to conceal various functional structures. These ceiling panels have also been implemented for various aesthetic purposes. Generally, these ceilings include runners and interconnecting cross-members which support a plurality of ceiling tiles. The ceiling tiles define a space between the architectural ceiling which can accommodate various functional elements such as power and data elements. These functional elements can be independently routed and structurally attached to the ceiling of a building. This independent routing of these elements can lead to a disorganized arrangement of these functional elements. Moreover, these arrangements of elements may vary from building to building. As a result, easy access to a particular functional element can be cumbersome. Moreover, these disorganized arrangements are not readily reconfigurable to respond to the changing needs of the building occupants.

There continues to be a need to provide a ceiling system that can readily respond to the changing needs of building occupants. In addition, a ceiling system is needed that can minimize infrastructure and create a more economical and "green" environment. Lastly, the use of new technologies now requires that new functional elements, e.g., wireless communications elements, be implemented in the ceiling environment or that previous elements be replaced. Yet,

many previous ceiling systems failed to readily accommodate such new technologies or the replacement of outdated functional elements.

Summary of the Invention

The present invention is directed to an improved ceiling system that supports various functional elements in a highly organized and aesthetic manner.

According to a first aspect of the present invention, a ceiling system for the delivery of utilities to a workspace is provided. A plurality of anchors is connected to a ceiling of a workspace. The anchors are arranged to form a grid. A plurality of substantially vertically extending support members is attached to the anchors. The support members are adapted to support a plurality of utilities and a ceiling member.

According to another aspect of the invention, a method for the delivery of utilities in an open plan work environment is provided. The method includes securing a plurality of anchors to a ceiling of a work environment. The anchors are arranged to form a grid. A plurality of support members is connected to at least some of the anchors. Data cabling is connected to at least some of the support members at a substantially uniform data point along the support members. Power cabling is connected to at least some of the support members at a substantially uniform power point along the support members. A ceiling panel is connected to at least some of the support members.

As used herein the term "connected to" is intended to be interpreted broadly and to include direct and indirect connections.

The present invention, together with attendant objects and advantages, will be best understood with reference to the detailed description below in connection with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a ceiling system in accordance with a first embodiment of the present invention illustrating a power system in a two ceiling panel environment;

FIG. 2 is a perspective view of another embodiment of a ceiling system illustration a power system in a single ceiling panel environment;

FIG. 3 is an enlarged view of various support members interconnected by the power system;

FIG. 4 is an enlarged view of various support members interconnected by the power system and a support rod for use with lighting elements;

FIG. 5 is a perspective view of another embodiment of the ceiling system in a building environment with a sloped roof;

FIG. 6 is a perspective view of a support rod with two different lighting elements shown attached;

FIG. 7 is a side view of an embodiment of a support member with a data element shown in cross-section;

FIG. 8 is a side view of an embodiment of a first connector;

FIG. 9 is a top view of the connector shown in FIG. 8;

FIG. 10 is a side view of an embodiment of a second connector; and

FIG. 11 is a top view of the connector shown in FIG. 10.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention is described with reference to the drawings in which like elements are referred to by like numerals. The relationship and functioning of the various elements of this

invention are better understood by the following detailed description. However, the embodiments of this invention as described below are by way of example only, and the invention is not limited to the embodiments illustrated in the drawings. It should also be understood that the drawings are not to scale and in certain instances details have been omitted which are not necessary for an understanding of the present invention, such as conventional details of fabrication and assembly. In addition, like elements have been numbered identically in the different embodiments.

Referring now to the drawings and initially to FIG. 1, a first embodiment of the ceiling system 10 is illustrated. The ceiling system 10 provides a highly organized system for the delivery of utilities, e.g., power and data elements, to a workspace. In addition, the ceiling system 10 is readily changeable to suit the needs of occupants of a workspace and is adaptable for use with new and emerging technologies. The ceiling system 10 includes a lightweight panel member 12 that extends generally horizontally over the head of a standing worker or occupant. The panel member 12 is connected to the frame 14. Brackets 16 extend outward from the corners of the frame 14 and connect to the support members 30. For a further description of the panel members 12, the frame 14 and brackets 16, reference is made to U.S. Provisional Patent Application No. _____, filed on April 4, 2002 in the name of Robert Insalaco, the disclosure of which is hereby incorporated by reference.

With reference to FIGS. 1 and 7, the support members 30 are illustrated. The support members 30 are suspended from a top surface, e.g., the architectural ceiling of a building. The support members 30 included anchors 34, suspension cables 36 and support tube 38. The anchors 34 are connected to the top surface of a building using conventional fastening techniques. The anchors 34 include a flat base portion 44 and a curved portion 46. In a

preferred embodiment, the anchors 34 are formed from a steel material. As illustrated in FIG. 1, and will be further described herein, the anchors 34 are arranged in a matrix or grid with the other functional elements built off selected anchors in order to provide the ceiling system 10 in the desired location.

A suspension cable 36 is connected to the curved portion 46 of the anchor 34 and extends downward therefrom. In a preferred embodiment, the suspension cable 36 is a twisted steel cable adapted to support a load of at least 500 lbs. The suspension cable 36 passes through a centering cap 50 connected to the support tube 38. In a preferred embodiment, the support tube 38 is formed from a steel material. The support tube 38 includes a plurality of apertures 52 aligned along the length of the support tube 38. The apertures 52 are preferably cross-drilled to provide apertures around the support tube 38 at ninety degree angles to one another. The apertures 52 extend along the length of the support tube and around the support tube 36 in order to provide a range of positions for connection to utility or support elements. A set screw 56 secures the support tube 38 in a desired location along the suspension cable 36. In particular, depending on the top surface or architectural ceiling and the type of utility being supported, the support tube 38 may need to be positioned at different locations along the suspension cable 36.

Referring generally to FIG. 5, an embodiment of the ceiling system 70 is illustrated in a building having a sloped ceiling 72. In the illustrated embodiment, a data delivery system 74 is located on top of the power delivery system 76. A utility support rod 78 is positioned beneath the power delivery system 76. The panel member 12 and frame 14 are connected beneath the support rod 78. The ceiling system 70 illustrates the layered approach to arrangement of utility members of the present invention. The layered approach allows workers installing the different utility elements to be able to independently install each utility member.

Moreover, the layered approach to the arrangement of utilities provides a highly organized system that is easily reconfigured or updated as needed by the occupants of a building.

With reference to FIG. 7, an embodiment of the data delivery element 74 is illustrated. In particular, a slip 84 is shown attached to the suspension cable 36. The clip 84 includes fingers 86 that are adapted to grip the suspension cable 36. A cover portion 88 is flexible so as to provide easy access to the interior of the clip 84 where the data cables 89 are located. In a preferred embodiment, the clip 84 is formed from a plastic material.

Referring back to FIGS. 1- 5, the power delivery system 76 is illustrated. In the preferred embodiment illustrated, the power delivery system 76 is a generally conventional modular four circuit power system. In one embodiment, the power delivery system 76 can be constructed using portions 90 having a length of approximately ten feet. However, as those skilled in the art will recognize, various lengths may be provided. The power delivery system 76 includes conventional connectors 92 for connection to functional elements such as lighting elements 100 or 102 (as illustrated in FIGS. 2, 4, 5 and 6) or for the delivery of power of the base surface through the pole 104 (as illustrated in FIG. 5). As best seen in FIGS. 3 and 4, the connectors 92 include a plurality of plugs 94 for connection to a mating plug 95 extending from the functional element such as lighting element 100. A conventional flex connector 110 (preferably formed from a flexible steel conduit) provides for the connection of the portions 90 at the support members 30. This flex connector 110 is particularly useful when the portions 90 extend at ninety degree angles to one another.

FIGS. 8 – 9 illustrated one embodiment of a connector 140 useful with the power system 76. The connector 140 is also useful with other elements such as support rob 78. Portions 90 of the power system 76 are connected at bracket 142 to the support member 30. The

bracket 142 includes a tube portion 144 adapted to slide over the support tube 38. A latch 146 is spring loaded 148 so as to cause the pin 150 to engage a selected aperture 52 along the length of the support tube 38.

Referring back to FIGS. 1, 2 and 4 – 6, the utility support rod 78 is illustrated. The support rod 78 is useful to support utilities such as the lighting elements 100, 102 or other utilities such as displays or other elements being attached above the head of a user. The support rod 78 provides a support surface for the support of the elements required by various building/electrical codes. The lighting element 100 is a low voltage halogen lighting element in the illustrated embodiment. The lighting element 102 is a fluorescent lighting element in the embodiment illustrated in FIGS. 5 – 6.

FIGS. 10 – 11 illustrate another embodiment of a connector 200 useful at intermediate locations along the ceiling system 10. The connector 200 includes a bracket portion 202 adapted to partially surround the support tube 38. A pin 206 is sized to engage one of the apertures 52 in order to secure the assembly in the desired location.

During installation of the ceiling system 10, a worker would lay a matrix of grid anchors 34 on the top surface or ceiling above the workspace. Depending upon the desired location and arrangement of the ceiling system 10, an installer would connect support members 30 as necessary to provide the ceiling system 10 in the desired location. By laying a matrix, additional support members 30 may be easily provided as needed. In addition, in the event the occupants of a building desire a different use for the workspace, the matrix allows installers to readily reconfigure the ceiling system 10 as necessary.

The embodiments described above and shown herein are illustrative and not restrictive. The scope of the invention is indicated by the claims rather than by the foregoing

description and attached drawings. The invention may be embodied in other specific forms without departing from the spirit of the invention. For example, other adjustment mechanisms may be used with the partitions of the present invention. In addition, the particular shapes of the partition members could be varied while still achieving the required functionality. Accordingly, these and any other changes which come within the scope of the claims are intended to be embraced herein.